

COTTAGE POLLUTION CONTROL PROGRAM

LAKE MANITOU

MANITOULIN ISLAND

July 1977

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SUMMARY

During July 1977, staff of the Ministry of the Environment completed a Cottage Pollution Control Survey of the sewage disposal systems servicing the dwelling units situated on the shoreline of Lake Manitou. The dwellings consisted of seasonal and permanent homes and commercial (tourist) establishments. The objective of the survey was to detect and initiate abatement work on those sewage systems found to be faulty.

Of the 316 sewage systems inspected, 187 were found to be performing satisfactorily, 107 were assessed as unsatisfactory due to problems ranging from a poorly constructed privy to a system permitting the direct discharge of sewage to the lake, and 22 systems could not be assessed due to insufficient information. Of the 107 systems that were judged to be unsatisfactory, 52 were referred to the Sudbury and District Health Unit for abatement procedures, while recommendations for improvements to the remaining 55 systems were provided to the owners at the time of the inspection.

The types of sewage disposal systems utilized and the method of disposal of washwater was determined for each of the dwellings.

Water samples were collected of the drinking water supplies and from the lake in front of each dwelling and examined for coliform bacteria. Samples were also collected further offshore in front of every fifth dwelling for chemical and bacteriological examination.

INTRODUCTION

Responding to the concerns of local citizens and the Manitoulin Planning Board, the Municipal and Private Abatement Section of the Ministry of the Environment undertook a survey of the sewage disposal systems on the shorelines of Lake Manitou during the month of July, 1977.

Residents had expressed their concern about the adequacy of the sewage disposal systems and their effect on the water quality of Lake Manitou. The Planning Board expressed interest in these topics as they related to future development on the lake and the preservation of the trout fishery.

The Ministry of Natural Resources also expressed concern that future development must be carefully controlled in order to ensure that no detrimental effects on the trout fishery are allowed.

Cottages with improperly designed or undersized disposal systems allow the entry of excessive amounts of nutrients (required by algae for their life cycles) into the lake. When present in high concentrations, these nutrients may cause excessive algae growth (blooms) which are unsightly and reduce the amount of oxygen available to fish in the bottom waters.

LAKE MANITOU

Lake Manitou, is the largest lake located on Manitoulin Island. The lake borders on the Townships of Bidwell, Billings, Sheguiandah, Assiginack and Sandfield (see map Appendix A). Approximately 320 establishments are located on the lake shore and an additional 400 lots have received approval, but have not yet been developed. Presently, Lake Manitou figures prominently in the Ministry of Natural Resources lake trout stocking program. The majority of lake trout yearlings stocked in all Ontario lakes are reared from eggs derived from trout obtained from Lake Manitou.

The following table summarizes the major physical characteristics of the lake.

Surface Area (m^2)	1.05×10^8	2.6×10^4 Acres
Drainage Area (m^2)	2.40×10^8	6.4×10^5 Acres
Mean Depth (m)	15.0	49.0 ft.
Volume (m^3)	1.58×10^9	5.58×10^{10} ft ³
Flushing Rate <u>(Lake vol)</u> year	0.079	
Outflow (m^3)	1.25×10^8	4.41×10^9 ft ³

SURVEY PROCEDURES

A field office was established from July 5 to 23, 1977 at Red Lodge, located on the northeast shore of Lake Manitou. Each property on the lake was visited by one of two crews. A unique survey number was assigned to each establishment and a detailed description of the cottage/residence was recorded for ease of future identification. A "Cottage Pollution Control Program" form was then completed with or without the aid of the owner.

Details concerning the lot size, type and number of plumbing fixtures, toilets, size and location of septic tank/tile field or other means of disposal, soil type and depth, and drinking water source were logged. Upon completion of the inspection, a classification was made and if necessary, a "Pollution Abatement Report" was completed and a copy left at the site. This report includes a summary of the inspection findings and recommendations for abatement procedures, if required. Cottagers with adequate systems, or systems which were functioning satisfactorily at the time of inspection, were left a letter which indicated the lot was inspected.

WATER SAMPLING

Drinking water samples were collected at 205 dwellings. A total of 326 surface water samples were also taken nearshore (< 10m) for bacteriological examination.

Chemical and bacteriological samples (for control purposes) were collected approximately 50 to 75m offshore of every fifth cottage.

The bacteriological samples were stored on ice and shipped in coolers to the Ministry of Health laboratory in Sudbury. Samples for chemical analyses were refrigerated and forwarded to the Ministry of the Environment laboratories, Toronto. Parameters for analysis included: pH, BOD₅, conductivity, turbidity, colour, suspended and dissolved solids, total and soluble phosphorus, free ammonia, total Kjeldahl nitrogen, nitrate nitrogen, iron, calcium, chloride and alkalinity.

SEWAGE SYSTEM CLASSIFICATION

The sewage disposal systems of all the premises surveyed were classified into one of the following categories:

CLASS 1 - SATISFACTORY: The systems presently met provincial standards relating to materials of construction, sizing, distances from water courses, and were properly maintained as outlined in Regulation 229, The Environmental Protection Act, 1971.

CLASS 2 - SATISFACTORY PERFORMANCE (ACCEPTABLE): No obvious signs of pollution or of system malfunction was noted at the time of inspection. The disposal system may be antiquated or may not precisely meet regulations, but no fault in operation were observed.

CLASS 3 - SUBSTANDARD: Systems with serious defects in construction, materials of construction, maintenance, sizing or systems located in poor soil conditions and/or were closer than the required distances to waterbodies. An immediate health or environmental concern existed.

CLASS 4 - NUISANCE - WASH WATER: A system allowing the disposal of sink water or laundry water onto the ground surface. As well as a potential health hazard, such discharges allow the untreated release of nutrients which may encourage weed growth and affect the aesthetics of the receiving waterbody.

CLASS 5 - NUISANCE - TOILET AND SOLID WASTES: Systems including poorly constructed or maintained privies. Also included in this category are garbage, scrap, etc. which allow conditions suitable for the procreation of vermin.

CLASS 6 - DIRECT POLLUTER: A system permitting human waste to directly enter the groundwater or surface water through piping or runoff on the ground surface, or after minimal (inadequate) treatment.

CLASS 7 - UNCLASSIFIED: Systems which could not be satisfactorily classified due to insufficient information or systems which at the time of inspection were under construction or appeared abandoned.

During the survey, the sewage disposal facilities for private dwellings and commercial establishments were classified as follows:

SEWAGE SYSTEM CLASSIFICATIONS - DWELLINGS

<u>CATEGORY</u>	<u>NUMBER OF COTTAGES</u>	<u>% OF TOTAL</u>
Satisfactory	27	9
Satisfactory Performance	156	52
Substandard	38	12
Nuisance-Wash water	52	17
Nuisance-Solid Waste	6	2
Direct Polluter	1	< 1
Unclassified	22	7

SEWAGE SYSTEM CLASSIFICATIONS - COMMERCIAL

<u>CATEGORY</u>	<u>NUMBER</u>	<u>% OF TOTAL</u>
Satisfactory Performance	4	29
Substandard	9	64
Unclassified	1	7

All systems classified as Substandard, Direct Polluter, and those Nuisance systems with peculiar circumstances, such as a laundry waste water discharge up slope of a well, were referred to the Sudbury and District Health Unit.

Overall, the majority of establishments (59%) were serviced by systems categorized by Satisfactory or Satisfactory Performance at the time of inspection.

It should be noted that the classification of a system as Satisfactory Performance is not necessarily a statement of endorsement or official approval of the system which, although functioning satisfactorily during the survey, may not meet current standards.

A total of 52 reports were referred to the Sudbury and District Health Unit for the initiation of the abatement portion of the program. Of the 42 private cottage reports, 38 were classified Substandard, 1 Direct Polluter and 3 Nuisance - Wash Water. The Nuisance reports were forwarded because of special on-site circumstances which included a discharge up slope of a well, a shower waste discharge into a ditch in a residential area, and one owner wishing to

upgrade his system. Of the 10 commercial reports, 9 were Substandard and one was reported Unclassified because of the use of a lagoon.

Commercial establishments consisted of rental accommodations such as cottages, cabins and tent and trailer sites. The majority, (11 of the 14 properties (79%)), were cottage establishments. One cabin/trailer park combination (7%), 1 trailer park (7%) and 1 cabin-only establishment (7%) were also inspected.

The sewage disposal systems at ten (71%) of the commercial properties were assessed as requiring the attention of the Sudbury and District Health Unit. Problems associated with the disposal systems were due to age, proximity to the lake and inadequate soil cover. Since most of the commercial properties were established over 30 years ago, the disposal systems constructed were not subject to present day standards.

Lake Manitou was the source of potable water for 11 (79%) commercial premises, only 5 of which had chlorination facilities. Two (14%) of the establishments obtained their potable water from wells and one (7%) obtained their supply from a spring.

RESULTS

A. Sewage Disposal

During the study, the sewage systems of 282 private cottages, 20 permanent residences and 14 commercial establishments were inspected, with 80 (26%) of these inspections conducted without the owner or tenant being on site.

Excluding commercial units, the following table outlines the types of sewage disposal systems utilized.

TYPES OF SEWAGE DISPOSAL SYSTEMS

<u>DISPOSAL SYSTEM</u>	<u>NUMBER OF RESIDENCES</u>	<u>PERCENT OF TOTAL</u>
Septic tank/tile field	186	62
Pit privies	75	25
Vault privies	4	1
Chemical toilets	3	1
Holding tanks	5	1
Unknown	29	10

B. Wash Water (Grey water) Disposal

Waste originating from sinks, laundry or showers was disposed of as follows:

DISPOSAL SYSTEMS FOR WASH WATER

<u>DISPOSAL SYSTEM</u>	<u>NUMBER</u>	<u>PERCENT OF TOTAL</u>
Septic tank/tile field	112	37
Leaching pits	86	28
Ground surface	51	17
Unknown	53	18

C. Water Quality

Pressure systems were utilized to provide potable water to 236 residences (78%) while 31 (10%) hand-carried or hand-pumped water. Staff were unable to determine the means of supply in 35 (12%) of the cases.

SOURCES OF DOMESTIC WATER SUPPLY

<u>SOURCE</u>	<u>NUMBER</u>	<u>PERCENT</u>
Lake Manitou	225	75
Wells	21	7
Springs	3	1
Imported	13	4
Unknown	40	13

The 49 samples collected 50 to 75m offshore indicated excellent water quality for recreational use, with all samples less than the criteria for Total Body Contact Recreation, (1000/100 ml Total coliforms and 100/100 ml fecal coliforms).

The surface water samples collected near the shore (< 10m from shore) only marginally indicated the presence of coliform bacteria surpassing the criteria. Twenty of the 326 surface samples (7%) were unacceptable, 8 (3%) of which exceeded total coliform criteria, 10 (3%) exceeded fecal coliform criteria and only 2 (1%) exceeded both total and fecal coliform criteria.

The following table summarizes the results of the drinking water bacteriological samples.

DRINKING WATER SOURCE	NUMBER OF SAMPLES	NUMBER OF SAMPLES WITH GREATER THAN 0 COUNTS	
		TOTAL COLIFORMS	FECAL COLIFORMS
Lake	186	74 (39%)	36 (19%)
Dug Well	7	2 (29%)	2 (29%)
Drilled Wells	8	2 (25%)	0 (0%)
Springs	2	1 (50%)	0 (0%)

SUMMARY OF CHEMICAL ANALYSES

PARAMETERS	RANGE	AVERAGE	PERMISSIBLE CRITERIA
pH	8.2 - 8.6	8.5	6.0 to 8.5**
Conductivity (umhos/cm)	259 - 270	268	
Turbidity (FTU's)	< 1 - 1.4	0.7	1.0*
Color (Hazen Units)	< 5 - 10	5.0	5*
Suspended Solids	< 1 - 1.6	1.3	
Dissolved Solids	171 - 185	175	500**
Total Phosphorous	<.001 - .030	0.006	A level not encouraging* algal growth (generally < .02)
Ammonia	.004 - .036	.012	0.5**
Iron	.01 - .09	0.02	0.3**
Calcium	30 - 32	31.0	
Chloride	3.1 - 8.0	4.0	250**
BOD ₅	0.2 - 2.0	0.74	

All values in mg/l unless otherwise indicated.

* For domestic water supplies (treated)

** For public surface raw water supplies.

The lake was noted to be extremely clear during the survey and the chemical data was indicative of acceptable water quality.

Drinking water samples indicated that over 80% were fecal coliform free and 61% total coliform free. Bacteriologically acceptable water would be ensured by following this Ministry's policy of chlorinating all surface waters before consumption.

The results of the 42 chemical control samples taken 50 to 75m from shore are summarized in the following table. Also listed are accepted levels for several of the parameters.

ABATEMENT PROGRAM

Under an agreement with the Sudbury and District Health Unit, the Ontario Ministry of the Environment has undertaken the responsibility for the completion of pollution surveys while the Health Unit assumes responsibility for the implementation of corrective measures. In order to ensure that the most serious problems received prompt attention, only reports on those systems assessed to be substandard or systems requiring immediate attention were forwarded to the Health Unit.

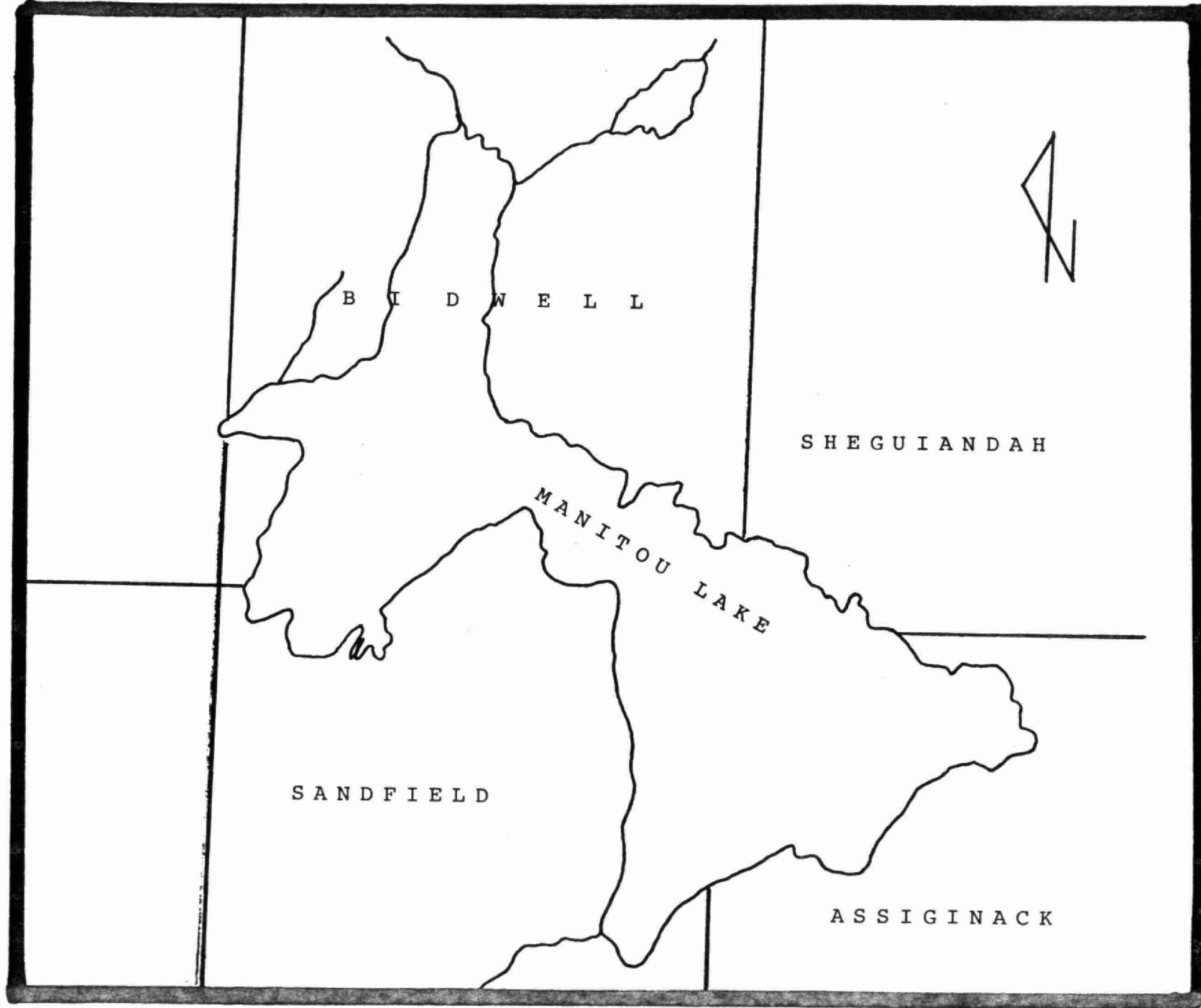
It is intended that Ministry staff will carry out further inspections to determine whether the owners have implemented the suggestions provided at the time of the survey.

CONCLUSIONS

The survey findings concluded that the majority of establishments were serviced by satisfactorily performing sewage disposal systems.

During July, 1977, the water quality data was indicative of low biological productivity with low nutrient concentrations and high water transparency. Except for a scattering of low coliform bacteria counts near the shoreline, the lake was bacteriologically of good quality. Steps taken to upgrade those systems found to be substandard will further lessen the impact of the sewage systems on the lake.

APPENDIX A



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